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BPT 4th Year

Asthma

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Introduction

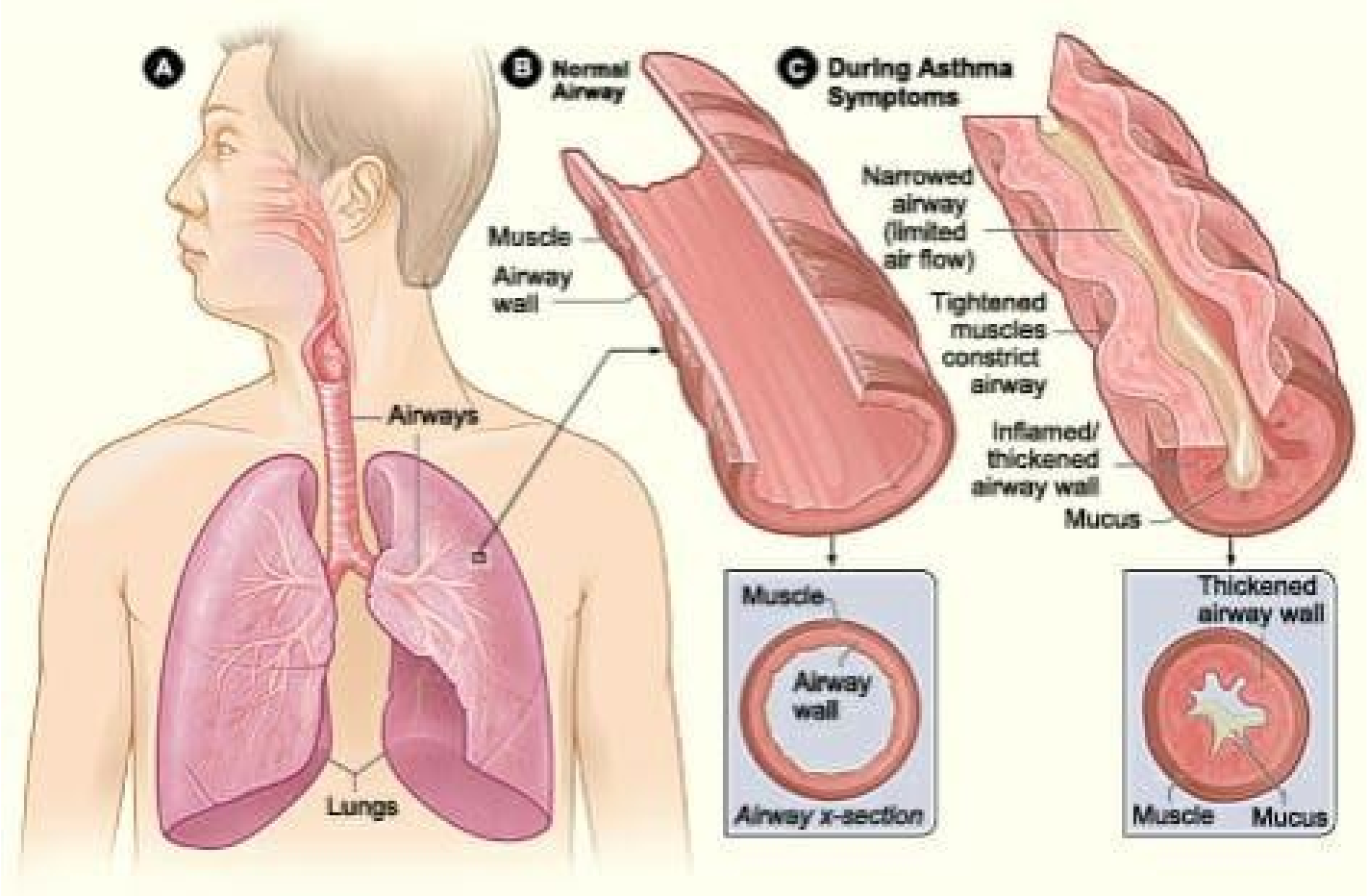
Asthma

Is a major noncommunicable disease (NCD) affecting children and adults.

Affects an estimated 262 million people in 2019 and caused 461000 deaths.

It is the most common chronic disease among children.

Symptoms can be controlled by inhaled medication and allow people with asthma to lead a normal, active life.



ANATOMY OF LUNGS

Anatomy of Lungs :-

Structure of the Lungs

1. **Right Lung**: Larger and has three lobes (upper, middle, and lower)

2. **Left Lung**: Smaller and has two lobes (upper and lower)

3. **Lung Parenchyma**: Functional tissue of the lungs, including alveoli, bronchioles, and blood vessels

4. **Pleura**: Double-layered membrane surrounding each lung, attached to the chest wall and diaphragm

Airway System

1. **Trachea (Windpipe)**: Divides into right and left primary bronchi

2. **Primary Bronchi**: One for each lung, dividing into secondary bronchi

3. **Secondary Bronchi**: One for each lobe, dividing into tertiary bronchi

4. **Tertiary Bronchi**: Divide into bronchioles

5. **Bronchioles**: Smaller airways, leading to alveoli

Alveoli and Gas Exchange

1. **Alveoli**l: Small, grape-like sacs where gas exchange occurs

2. **Alveolar Ducts**: Connect alveoli to bronchioles

3. **Alveolar-Capillary Membrane**: Thin membrane separating alveoli from blood capillaries, allowing for gas exchange

Blood Supply and Lymphatic System

1. **Pulmonary Arteries**: Carry deoxygenated blood from the heart to the lungs

2. **Pulmonary Veins**: Carry oxygenated blood from the lungs to the heart

3. **Lymphatic Vessels**: Remove waste and excess fluids from the lungs

Nerve Supply

1. **Phrenic Nerve**: Controls diaphragm movement

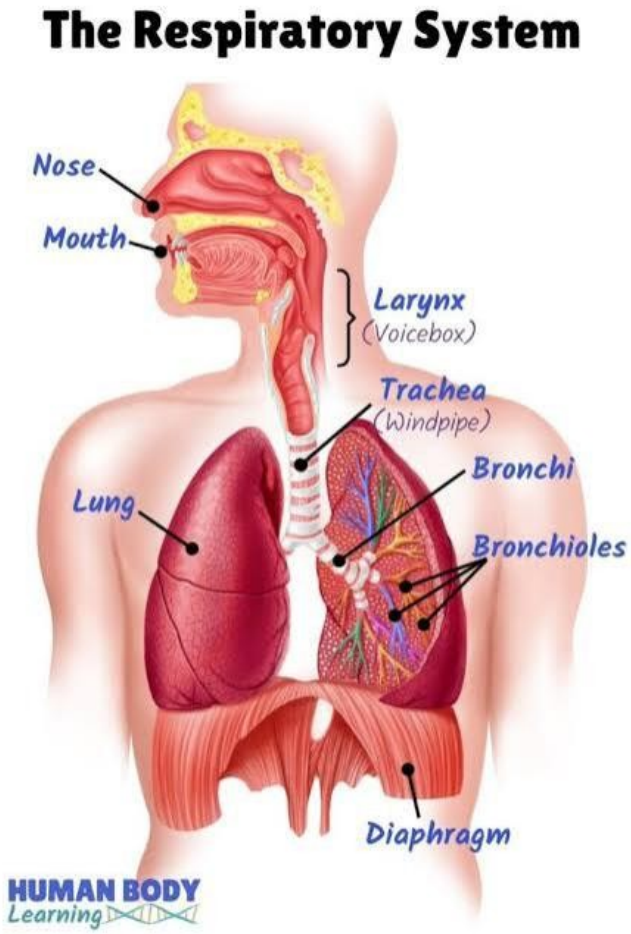
2. **Vagus Nerve**: Regulates bronchial smooth muscle and glands

Key Features

1. **Hilum**: Area where blood vessels, nerves, and airways enter and exit the lungs

2. **Fissures**: Deep grooves separating lung lobes

3. **Lingula**: Small, tongue-like projection of the left upper lobe.



CAUSES OF ASTHMA

Causes of Asthma :-

Its causes can be divided into two main categories : genetic and environmental.

Genetic Factors

1. **Family history**: Having a family member with asthma increases the risk.

2. **Genetic predisposition**: Certain genetic variants can affect airway responsiveness and inflammation.

Environmental Factors

1. **Allergens**: Common allergens like dust mites, pollen, mold, and pet dander can trigger asthma.

2. **Air pollution**: Exposure to poor air quality, especially particulate matter (PM), nitrogen dioxide (NO_2), and ozone (O_3).

3. **Respiratory infections**: Viral infections like the common cold and flu can trigger asthma.

4. **Tobacco smoke**: Exposure to secondhand smoke or smoking during pregnancy increases the risk.

5. **Obesity:** Being overweight or obese can increase the risk of developing asthma.

6. **Stress :** Emotional stress can trigger asthma symptoms.

7. **Hormonal changes:** Hormonal fluctuations during menstruation, pregnancy, or menopause can affect asthma.

8. **Medications:** Certain medications, such as beta-blockers and aspirin, can trigger asthma.

9. **Occupational exposures:** Exposure to chemicals, dust, or other substances in the workplace can trigger asthma.

Other Factors

1. **Premature birth:** Babies born prematurely are at a higher risk of developing asthma.

2. **Low birth weight:** Babies with low birth weight are at a higher risk of developing asthma.

3. **Maternal smoking during pregnancy:** Exposure to tobacco smoke during pregnancy increases the risk.

Keep in mind that asthma is a complex condition, and each person’s triggers and risk factors may vary. If you suspect you or someone you know has asthma, consult a healthcare professional for proper diagnosis and treatment.

TYPES OF ASTHMA

Types of asthma :-

There are several types of asthma, classified based on their severity, triggers, and underlying causes. Here are some of the main types of asthma:

1. Mild Asthma

Mild asthma is characterized by:

- Infrequent symptoms (less than 2 times a week)
- Nocturnal symptoms less than 2 times a month
- FEV1 (forced expiratory volume) greater than 80% of predicted value

2. Moderate Asthma

Moderate asthma is characterized by:

- Symptoms 2-6 times a week
- Nocturnal symptoms 3-4 times a month
- FEV1 60-80% of predicted value

3. Severe Asthma

Severe asthma is characterized by:

- Frequent symptoms (more than 6 times a week)
- Nocturnal symptoms more than 4 times a month
- FEV1 less than 60% of predicted value

4. Exercise-Induced Asthma (EIA)

EIA is triggered by physical activity, especially in cold, dry air.

5. Occupational Asthma

Occupational asthma is caused by exposure to specific substances in the workplace, such as chemicals, dust, or mold.

6. Allergic Asthma

Allergic asthma is triggered by allergens like dust mites, pollen, mold, or pet dander.

7. Non-Allergic Asthma

Non-allergic asthma is not triggered by allergens, but by other factors like stress, cold air, or respiratory infections.

8. Mixed Asthma

Mixed asthma is a combination of allergic and non-allergic asthma.

9. Steroid-Resistant Asthma

Steroid-resistant asthma does not respond to corticosteroid treatment.

10. Brittle Asthma

Brittle asthma is characterized by sudden, severe attacks with little warning.

SIGNS AND SYMPTONS OF ASTHMA

Signs and symptoms of asthma :-

Common Symptoms

1. Wheezing: High-pitched whistling sound while breathing out

2. Coughing: Dry, persistent cough, especially at night or early morning

3. Shortness of breath: Feeling of not being able to catch breath

4. Chest tightness: Feeling of constriction or tightness in the chest

5. Difficulty speaking: In severe cases, asthma can make it hard to speak

Less Common Symptoms

1. Fatigue: Feeling tired or weak due to poor breathing

2. Rapid breathing: Breathing faster than normal

3. Blue-tinged lips or fingers: In severe cases, lack of oxygen can cause cyanosis

4. Confusion or disorientation: In severe cases, lack of oxygen can affect brain function

Asthma Attack Symptoms

1. Sudden onset of symptoms: Wheezing, coughing, shortness of breath, and chest tightness

2. Increased symptoms: Symptoms worsen over time, making it harder to breathe

3. Peak flow meter readings: Lower than normal readings on a peak flow meter

Silent Asthma Symptoms

1. No obvious symptoms: Asthma can be present without noticeable symptoms

2. Normal lung function tests: Lung function tests may appear normal, even if asthma is present

3. Increased airway responsiveness: Airways may still be sensitive, even if symptoms are not apparent.

Risk factors :-

Asthma is more likely if other family members also have asthma – particularly a close relative, such as a parent or sibling.

Asthma is more likely in people that have other allergic conditions, eczema and rhinitis (hay fever).

Urbanisation is associated with increased asthma prevalence, probably due to multiple lifestyle factors.

Events in early life affect the developing lungs and can increase the risk of asthma. E.g. low birth weight, prematurity, exposure to tobacco smoke and other sources of air pollution, and viral respiratory infections.

Exposures to a range of environmental allergens and irritants are also thought to increase the risk of asthma, eg indoor and outdoor air pollution, house dust mites, moulds, and occupational exposure to chemicals, fumes, or dust.

Children and adults who are overweight or obese are at a greater risk of asthma.

DIAGNOSIS

Diagnosis :-

Diagnosing asthma involves a combination of medical history, physical examination, and diagnostic tests. Here's a step-by-step guide -

Medical History

1. Symptom assessment: Doctor asks about symptoms, such as wheezing, coughing, shortness of breath, and chest tightness.

2. Allergy history: Doctor inquires about allergies, eczema, or other allergic conditions.

3. Family history: Doctor asks about family members with asthma or other allergic conditions.

4. Occupational exposure: Doctor asks about workplace exposure to potential asthma triggers.

Physical Examination

1. Lung function assessment: Doctor listens to lungs with a stethoscope to check for wheezing or other abnormal sounds.

2. Breathing rate and rhythm: Doctor assesses breathing rate and rhythm.

3. Chest examination: Doctor examines the chest for signs of asthma, such as wheezing or tightness.

Diagnostic Tests

1. Spirometry: Measures lung function, specifically forced expiratory volume (FEV1) and forced vital capacity (FVC).

2. Peak flow meter: Measures the fastest rate at which air can be blown out of the lungs.

3. Methacholine challenge test: Assesses airway responsiveness to methacholine, a substance that can trigger asthma symptoms.

4. Allergy testing: Identifies specific allergens that may trigger asthma symptoms.

5. Chest X-ray or CT scan: Evaluates lung structure and function.

6. Arterial blood gas (ABG) test: Measures oxygen and carbon dioxide levels in the blood.

Diagnosis Criteria

Asthma diagnosis is based on a combination of:

1. Symptoms: Recurring episodes of wheezing, coughing, shortness of breath, and chest tightness.

2. Lung function tests: Abnormal results on spirometry, peak flow meter, or methacholine challenge test.

3. Response to treatment: Improvement in symptoms and lung function with asthma medication.

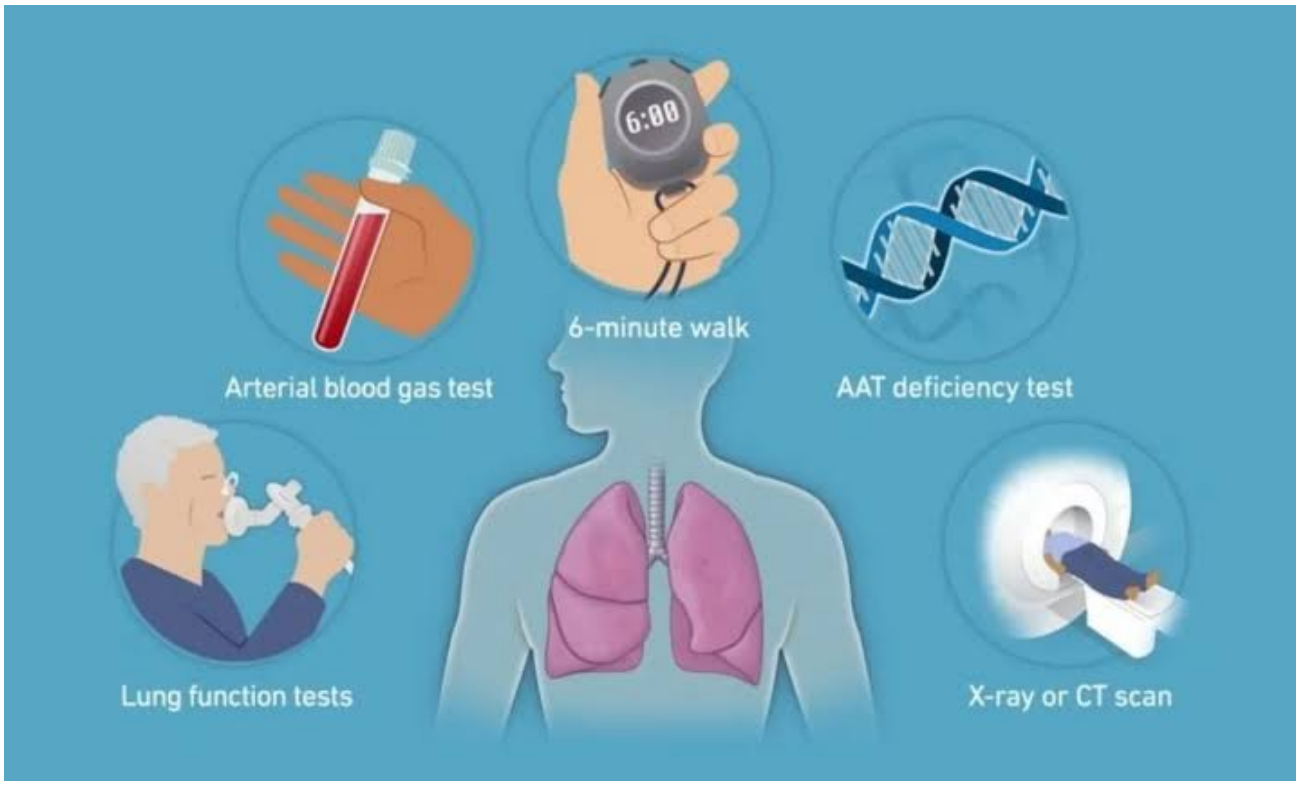
Differential Diagnosis

The doctor will rule out other conditions that may mimic asthma symptoms, such as:

1. Chronic obstructive pulmonary disease (COPD).

2. Pneumonia.

3. Bronchitis.
4. Heart failure.
5. Gastroesophageal reflux disease (GERD).



MEDICAL MANAGEMENT

Management :-

Medical Management

1.Bronchodilators:- Quick-relief medications, such as inhalers (e.g., albuterol), that relax airway muscles.

2. Inhaled Corticosteroids (ICS): Long-term control medications that reduce inflammation (e.g., fluticasone).

3. Combination Inhalers: Combination of bronchodilators and ICS (e.g., fluticasone-salmeterol).

4. Leukotriene Modifiers: Oral medications that block leukotrienes, which cause inflammation (e.g., montelukast).

5. Theophylline: Oral medication that relaxes airway muscles and reduces inflammation.

6. Biologics: Targeted therapies for severe asthma, such as omalizumab, mepolizumab, and benralizumab.

Surgical Management

1. Bronchial Thermoplasty: A minimally invasive procedure that uses heat to reduce airway smooth muscle.

2. Lung Transplantation: In severe cases, lung transplantation may be necessary.

Physiotherapy Management

1. Breathing Exercises: Techniques like diaphragmatic breathing, yoga, and Pilates to improve lung function.

2. Aerobic Exercise: Regular aerobic exercise, such as walking or cycling, to improve cardiovascular fitness.

3. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body.

4. Postural Drainage: Techniques to help clear mucus from the lungs.

5. Pulmonary Rehabilitation: Comprehensive programs that include exercise, education, and support to manage asthma.

Lifestyle Modifications

1. Avoid Triggers: Identify and avoid triggers, such as allergens, tobacco smoke, and air pollution.

2. Maintain a Healthy Weight: Obesity can exacerbate asthma symptoms.

3. Stay Hydrated: Drink plenty of water to help thin mucus.

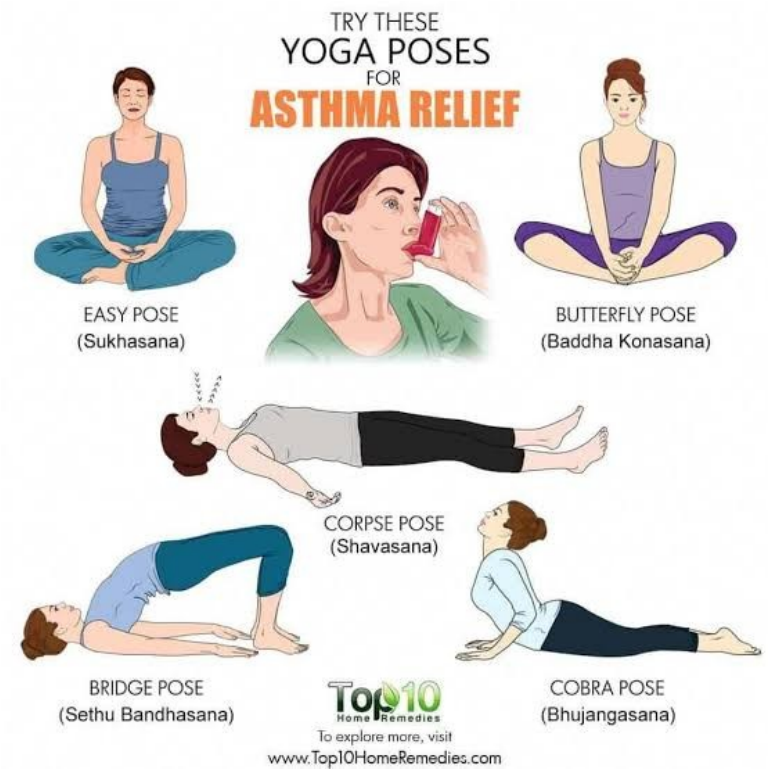
4. Manage Stress: Stress can trigger asthma symptoms; engage in stress-reducing activities like meditation or yoga.

Monitoring and Follow-up

1. Peak Flow Monitoring: Regularly track peak flow rates to monitor lung function.

2. Symptom Tracking: Keep a symptom journal to monitor frequency and severity of symptoms.

3. Regular Follow-ups: Schedule regular appointments with your healthcare provider to adjust treatment plans as needed.



ASSESSMENT OF ASTHMA

Assessment of Asthma :-

Subjective Assessment

Name -

Age -

Sex -

Admission date -

Discharge date –

1. Medical History: Ask about previous asthma diagnoses, hospitalizations, and emergency department visits.

2. Symptom Assessment: Ask about frequency, severity, and duration of symptoms such as:

(1). Wheezing

(2). Coughing

(3). Shortness of breath

(4). Chest tightness

3. Trigger Identification: Ask about potential triggers such as:

(1). Allergens (e.g., dust mites, pollen, mold, pet dander)

(2). Irritants (e.g., tobacco smoke, strong odors, air pollution)

(3). Exercise

(4). Emotional stress

4. Quality of Life: Ask about the impact of asthma on daily life, including:

(1). Sleep disturbances

(2). Work or school absenteeism

(3). Social activities

(4). Emotional well-being

Objective

Assessment

1. Vital Signs: Measure:

(1). Respiratory rate

(2). Heart rate

(3). Blood pressure

(4). Oxygen saturation (SpO2)

2. Lung Function Tests: Perform:

(1). Spirometry (e.g., FEV1, FVC)

(2). Peak flow meter

3. Physical Examination: Perform a thorough physical examination, including:

(1). Lung auscultation (listening to lung sounds)

(2). Chest examination - (inspecting for signs of respiratory distress)

Additional Assessments

1. Asthma Control Test (ACT): A standardized questionnaire to assess asthma control.

2. Asthma Quality of Life Questionnaire (AQLQ): A standardized questionnaire to assess the impact of asthma on quality of life.

3. Peak Flow Diary: A patient-held record of peak flow measurements to monitor asthma control.

Severe Asthma Diagnosis & Assessment

FIRST CONSIDER....

IS IT ASTHMA?

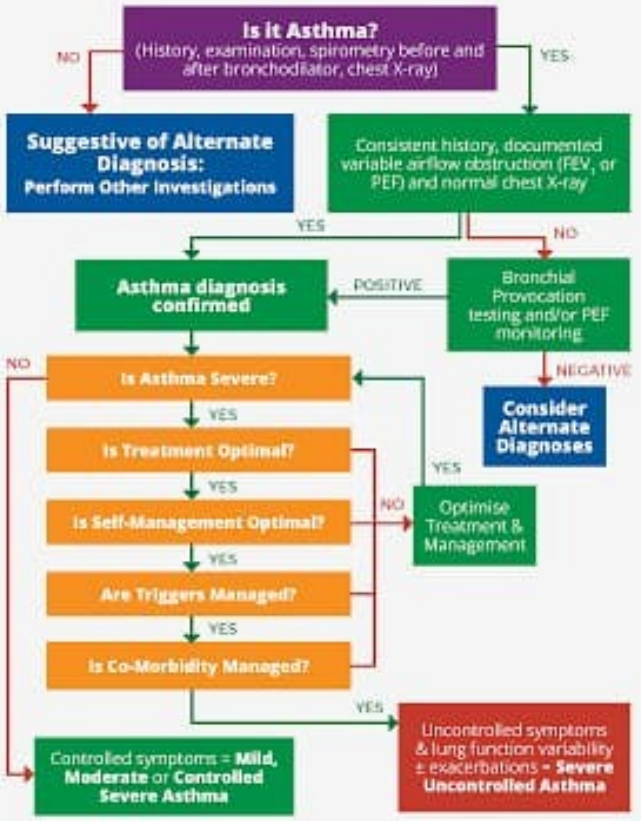
PERFORM

- Medical history
- Clinical questionnaires
- Physical examination
- Assessment of variable airflow limitation (spirometry)
- Comorbidity assessment

IS THE ASTHMA SEVERE?

- Requires high dose treatment
- Assess adherence
- Assess inhaler technique
- Assess aggravating factors

SYSTEMATIC MULTIDIMENSIONAL ASSESSMENT IS IMPORTANT AND IMPROVES ASTHMA OUTCOMES



SYSTEMATIC ASSESSMENT CAN:

- Confirm an asthma diagnosis
- Assess for alternative diagnoses
- Address self-management skills and triggers
- Identify and manage co-morbidities
- Identify disease mechanism (endotype) for targeted treatment
- Improve quality of life, asthma control and reduce attacks

References: Clark et al. 2017

Developed as part of the SEVERE ASTHMA TOOLKIT
toolkit.severeasthma.org.au

CASE STUDY

Case Study

Case Study 1: Asthma Management

Patient Information:

- **Name:** Mumtaz Ali
- **Age:** 28 years
- **Sex:** Female
- **Occupation:** Marketing Manager

- **Medical History:** Allergic rhinitis, eczema

Chief Complaint:

Patient presents with recurring episodes of wheezing, coughing, and shortness of breath, especially at night and early morning.

History of Present Illness:

Symptoms started 6 months ago, shortly after moving to a new apartment. She initially attributed her symptoms to allergies but noticed they worsened over time. She has tried over-the-counter medications and avoided potential allergens, but her symptoms persist.

Physical Examination:

- **Vital Signs:**

- Respiratory rate: 22 breaths/min

- Heart rate: 100 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 95%

- **Lung Auscultation:** Bilateral wheezing and crackles
- **Chest Examination:** Normal

<u>Diagnostic Tests:</u>

- **Spirometry:**

- FEV1: 60% predicted

- FVC: 80% predicted

- **Peak Flow Meter:** 250 L/min (50% predicted)

- **Methacholine Challenge Test:** Positive

Assessment and Diagnosis:

Mumtaz Ali's symptoms, physical examination, and diagnostic test results are consistent with asthma. Her asthma severity is classified as moderate persistent asthma.

Treatment Plan:

1. **Inhaled Corticosteroids (ICS):** Fluticasone 250 mcg twice daily

2. **Short-Acting Beta-Agonist (SABA):** Albuterol 90 mcg as needed

3. **Long-Acting Beta-Agonist (LABA):** Salmeterol 50 mcg twice daily (added after 2 weeks if symptoms persist)

4. **Asthma Education:** Educate Mumtaz Ali on proper inhaler technique, asthma self-management, and trigger avoidance

5. **Follow-up:** Schedule follow-up appointments every 2-3 months to monitor symptoms, lung function, and adjust treatment plan as needed

Physiotherapy Management:

Mumtaz Ali will benefit from a physiotherapy program focusing on:

1. Breathing exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health.

2. Aerobic exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms.

3. Strength training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function.

4. Postural drainage: Techniques to help clear mucus from the lungs.

5. Relaxation techniques: Stress-reducing activities, such as meditation or deep breathing, to manage stress and anxiety.

Outcome:

Mumtaz Ali's symptoms improved significantly within 2 weeks of starting treatment. Her lung function tests showed improvement, and she reported better control over her symptoms. With ongoing education, support, and physiotherapy, Mumtaz Ali is able to manage her asthma effectively and maintain a good quality of life

Case Study 2: Severe Asthma Management

Patient Information:

- **Name:** Arun Tejwat
- **Age:** 35 years
- **Sex:** Male
- **Occupation:** Engineer
- **Medical History:** Hypertension, allergic rhinitis

Chief Complaint:

Arun presents with severe shortness of breath, wheezing, and coughing, which worsen at night and early morning, and are triggered by exposure to dust, pollen, and tobacco smoke.

History of Present Illness:

Arun's symptoms started 10 years ago, but have worsened significantly over the past 2 years. He has experienced frequent exacerbations, requiring multiple hospitalizations and emergency department visits. Despite using multiple inhalers and oral medications, Arun's symptoms remain poorly controlled.

Physical Examination:

- **Vital Signs:**

- Respiratory rate: 28 breaths/min

- Heart rate: 110 beats/min

- Blood pressure: 140/90 mmHg

- Oxygen saturation (SpO2): 88%

- **Lung Auscultation:** Bilateral wheezing, crackles, and rhonchi
- **Chest Examination:** Hyperinflation, use of accessory muscles

Diagnostic Tests:

- **Spirometry:**

- FEV1: 40% predicted

- FVC: 60% predicted

- **Peak Flow Meter:** 150 L/min (30% predicted)

Methacholine Challenge Test: Positive

- Allergy Testing: Positive for dust mites, pollen, and pet dander

Assessment and Diagnosis:

Arun's symptoms, physical examination, and diagnostic test results are consistent with severe persistent asthma. His asthma severity is classified as Step 5 according to the Global Initiative for Asthma (GINA) guidelines.

Treatment Plan:

1. High-Dose Inhaled Corticosteroids (ICS): Fluticasone 500 mcg twice daily

2. Long-Acting Beta-Agonist (LABA): Salmeterol 50 mcg twice daily

3. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

4. Oral Corticosteroids: Prednisone 10 mg daily for 2 weeks, then tapered

5. Anti-IgE Therapy: Omalizumab 150 mg every 2 weeks

6. Asthma Education: Educate Arun on proper inhaler technique, asthma self-management, and trigger avoidance

7. Follow-up: Schedule follow-up appointments every 1-2 months to monitor symptoms, lung function, and adjust treatment plan as needed

Physiotherapy Management:

Arun will benefit from a physiotherapy program focusing on:

1. Breathing exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health.

2. Aerobic exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms.

3. Strength training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function.

4. Postural drainage: Techniques to help clear mucus from the lungs.

5. Relaxation techniques: Stress-reducing activities, such as meditation or deep breathing, to manage stress and anxiety.

Outcome:

Arun's symptoms improved significantly within 6 weeks of starting treatment. His lung function tests showed improvement, and he reported better control over his symptoms. With ongoing education, support, and physiotherapy, Arun is able to manage his severe asthma effectively and reduce his risk of exacerbations and hospitalizations.

Case Study 3 : Congenital Asthma Management

Patient Information:

- **Name:** Roshni
- **Age:** 1 month
- **Sex:** Female
- **Birth Weight:** 2.5 kg
- **Medical History:** Born at 38 weeks gestation via cesarean section

Chief Complaint:

Roshni presents with recurrent episodes of wheezing, coughing, and shortness of breath, which worsen at night and early morning.

History of Present Illness:

Roshni's symptoms started immediately after birth. She was admitted to the neonatal intensive care unit (NICU) for respiratory distress and required oxygen therapy. Despite treatment, her symptoms persist.

Physical Examination:

- Vital Signs:

- Respiratory rate: 60 breaths/min

- Heart rate: 160 beats/min

- Oxygen saturation (SpO2): 92%

- Lung Auscultation: Bilateral wheezing and crackles
- Chest Examination: Retractions, use of accessory muscles

Diagnostic Tests:

- Chest X-ray: Hyperinflation, peribronchial cuffing

- Arterial Blood Gas (ABG): pH 7.30, $PaCO_2$ 45 mmHg, PaO_2 60 mmHg

- Pulmonary Function Tests (PFTs): Not feasible due to age

Assessment and Diagnosis:

Roshni's symptoms, physical examination, and diagnostic test results are consistent with congenital asthma.

Treatment Plan:

1. Inhaled Corticosteroids (ICS): Fluticasone 100 mcg twice daily via nebulizer

2. Short-Acting Beta-Agonist (SABA): Albuterol 2.5 mg via nebulizer as needed

3. Oxygen Therapy: As needed to maintain $SpO_2 \geq 92\%$

4. Asthma Education: Educate parents on proper nebulizer technique, asthma self-management, and trigger avoidance

Physiotherapy Management:

Roshni will benefit from a physiotherapy program focusing on:

1. Chest Physiotherapy: Gentle chest vibrations and percussions to help clear mucus.

2. Positioning: Prone or side-lying positions to improve lung expansion and reduce respiratory distress.

3. Breathing Support: Assisted breathing techniques, such as bag-valve-mask ventilation, as needed.

4. Parent Education: Educate parents on proper handling, positioning, and breathing support techniques.

Outcome:

Roshni's symptoms improved significantly within 2 weeks of starting treatment. Her oxygen saturation levels improved, and she required less oxygen therapy. With ongoing physiotherapy and medical management, Roshni's congenital asthma is well-controlled, and she is able to thrive.

Case Study 4 : Asthma Management

Patient Information:

- **Name:** Raju Singh
- **Age:** 40 years
- **Sex:** Male
- **Occupation:** Perfume factory worker
- **Medical History:** Hypotension, gastroesophageal reflux disease (GERD)

Chief Complaint:

Raju presents with recurring episodes of severe shortness of breath, wheezing, and coughing, which are triggered by exposure to perfume.

History of Present Illness:

Raju's symptoms started 5 years ago, shortly after beginning work at the perfume factory. He initially experienced mild symptoms, but they worsened over time. Despite using medications and avoiding perfume, his symptoms persist.

Physical Examination:

- Vital Signs:

- Respiratory rate: 25 breaths/min

- Heart rate: 110 beats/min

- Blood pressure: 130/85 mmHg

- Oxygen saturation (SpO2): 90%

- Lung Auscultation: Bilateral wheezing, crackles, and rhonchi
- Chest Examination: Hyperinflation, use of accessory muscles

Diagnostic Tests:

- **Spirometry:**

- FEV1: 50% predicted

- FVC: 70% predicted

- Peak Flow Meter: 200 L/min (40% predicted)
- Methacholine Challenge Test: Positive
- Allergy Testing: Positive for perfume and fragrances

Assessment and Diagnosis:

Raju's symptoms, physical examination, and diagnostic test results are consistent with occupational asthma triggered by perfume.

Treatment Plan:

1. Inhaled Corticosteroids (ICS): Triamcinolone 300 mcg twice daily

2. Short-Acting Beta-Agonist (SABA): Levalbuterol 90 mcg as needed

3. Long-Acting Beta-Agonist (LABA): Formoterol 4.5 mcg twice daily

4. Leukotriene Modifier: Montelukast 10 mg daily

5. Avoidance of Perfume: Raju will need to avoid exposure to perfume and fragrances at work and at home

6. Asthma Education: Educate Raju on proper inhaler technique, asthma self-management, and trigger avoidance

Physiotherapy Management:

Raju will benefit from a physiotherapy program focusing on:

1. Breathing exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health.

2. Aerobic exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms.

3. Strength training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function.

4. Relaxation techniques: Stress-reducing activities, such as meditation or deep breathing, to manage stress and anxiety.

5. Workplace modifications: Educate Raju on workplace modifications to reduce exposure to perfume and fragrances.

Outcome:

Raju experienced significant improvement in his symptoms and lung function within 3 months of starting treatment. He was able to reduce his medication use and return to work with minimal symptoms. However, he continued to experience occasional exacerbations, which required adjustments to his treatment plan. With ongoing monitoring and adjustments to his treatment plan

Case Study 5 : Asthma Management due to Chest Deformity

Patient Information:

- **Name:** Angelo Mathews
- **Age:** 30 years
- **Sex:** Male
- **Occupation:** Software Engineer
- **Residence:** Lives in a cold climate area
- **Medical History:** Pectus excavatum (chest deformity), allergic rhinitis

Chief Complaint:

Angelo presents with recurring episodes of shortness of breath, wheezing, and coughing, which worsen in cold weather and during physical activity.

History of Present Illness:

Angelo's symptoms started 5 years ago, shortly after moving to a cold climate area. He initially experienced mild symptoms, but they worsened over time. Despite using medications and avoiding cold air, his symptoms persist.

Physical Examination:

- **Vital Signs:**

- Respiratory rate: 22 breaths/min

- Heart rate: 100 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 92%

- Lung Auscultation: Bilateral wheezing and crackles
- Chest Examination: Pectus excavatum, decreased chest expansion
- Chest X-ray: Pectus excavatum, hyperinflation

Diagnostic Tests:

- Spirometry:

- FEV1: 60% predicted

- FVC: 80% predicted

- Peak Flow Meter: 250 L/min (50% predicted)
- Methacholine Challenge Test: Positive

Assessment and Diagnosis:

Angelo's symptoms, physical examination, and diagnostic test results are consistent with asthma due to chest deformity (pectus excavatum).

Treatment Plan:

1. Inhaled Corticosteroids (ICS): Fluticasone 250 mcg twice daily

2. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

3. Long-Acting Beta-Agonist (LABA): Salmeterol 50 mcg twice daily

4. Leukotriene Modifier: Montelukast 10 mg daily

5. Avoidance of Cold Air: Angelo will need to avoid exposure to cold air and use a mask when outdoors in cold weather

6. Asthma Education: Educate Angelo on proper inhaler technique, asthma self-management, and trigger avoidance

7. Homeopathic Medicine:

- **Arsenicum album 30C:** 2-3 times a day to help alleviate respiratory symptoms
- **Ipecacuanha 30C**: 2-3 times a day to help alleviate coughing and wheezing
- **Euphrasia 30C:** 2-3 times a day to help alleviate eye and respiratory symptoms

Physiotherapy Management:

Angelo will benefit from a physiotherapy program focusing on:

1. Chest Mobility Exercises: To improve chest expansion and reduce the impact of pectus excavatum on lung function.

2. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health.

3. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms.

4. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function.

5. Postural Education: Educate Angelo on proper posture to reduce the impact of pectus excavatum on lung function.

Outcome:

Angelo experienced significant improvement in his symptoms and lung function within 3 months of starting treatment. He was able to reduce his medication use and engage in physical activities without experiencing symptoms. With ongoing monitoring and adjustments to his treatment plan, Angelo is able to manage his asthma effectively and maintain a good quality of life.

Case Study 6: Asthma Management due to Genetic Factors with Pneumonia

Patient Information:

- **Name:** Humza
- **Age:** 14 years
- **Sex:** Male
- **Occupation:** Student
- **Medical History:** Family history of asthma
- **Genetic Testing:** Confirmed genetic predisposition to asthma
- **Current Illness:** Pneumonia

Chief Complaint:

Humza presents with recurring episodes of shortness of breath, wheezing, and coughing, which worsen at night and early morning. He also complains of fever, chills, and chest pain.

History of Present Illness:

Humza's symptoms started 5 years ago, and have worsened over time. Despite using medications and avoiding triggers, his symptoms persist. He was recently diagnosed with pneumonia and is currently undergoing treatment.

Physical Examination:

- **Vital Signs:**

- Respiratory rate: 30 breaths/min

- Heart rate: 120 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 88%

- Temperature: 102°F (39°C)

- **Lung Auscultation:** Bilateral wheezing, crackles, and rales
- **Chest Examination:** Dullness to percussion, decreased chest expansion
- **Sputum Examination:** Thick, yellow-green sputum (initially clear or white)

Diagnostic Tests:

- Spirometry:

- FEV1: 50% predicted

- FVC: 70% predicted

- Peak Flow Meter: 200 L/min (40% predicted)

- Methacholine Challenge Test: Positive
- Chest X-ray: Bilateral infiltrates consistent with pneumonia
- Blood Cultures: Positive for Streptococcus pneumoniae

Assessment and Diagnosis:

Humza's symptoms, physical examination, and diagnostic test results are consistent with asthma due to genetic factors, complicated by pneumonia.

Treatment Plan:

1. Antibiotics: Amoxicillin 500 mg three times a day for 7-10 days

2. Inhaled Corticosteroids (ICS): Fluticasone 250 mcg twice daily

3. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

4. Long-Acting Beta-Agonist (LABA): Salmeterol 50 mcg twice daily

5. Leukotriene Modifier: Montelukast 10 mg daily

6. Ayurvedic Medicine:

- Tulsi (Ocimum sanctum): 2-3 times a day to help alleviate respiratory symptoms
- Turmeric (Curcuma longa): 2-3 times a day to help reduce inflammation
- Ginger (Zingiber officinale): 2-3 times a day to help alleviate coughing and wheezing

7. Asthma Education: Educate Humza on proper inhaler technique, asthma self-management, and trigger avoidance

Physiotherapy Management:

Humza will benefit from a physiotherapy program focusing on:

1. Yoga Exercises:

- Pranayama: Deep breathing exercises to improve lung function
- Asanas: Yoga postures to improve flexibility and strength
- Savasana: Relaxation technique to reduce stress and anxiety

2. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health

3. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms

4. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function

5. Postural Education: Educate Humza on proper posture to reduce the impact of asthma on lung function

Outcome:

Humza's pneumonia was treated successfully with antibiotics, and his asthma symptoms improved significantly within 3 months of starting treatment. His sputum color changed from yellow-green to clear, indicating reduced inflammation and infection. He was able to reduce his medication use and engage in physical activities without experiencing symptoms. With ongoing monitoring and adjustments to his treatment plan.

Case Study 7 : Asthma Management with Tuberculosis in a Sportsperson

Patient Information:

- **Name:** Karan Singh
- **Age:** 25 years
- **Sex:** Male
- **Occupation:** Professional Cricketer
- **Medical History:** Asthma
- **Current Illness:** Tuberculosis (TB)

Chief Complaint:

Karan presents with recurring episodes of shortness of breath, wheezing, and coughing, which worsen at night and early morning. He also complains of fever, weight loss, and fatigue, which are affecting his athletic performance.

History of Present Illness:

Karan's asthma symptoms started 10 years ago, and have worsened over time. He was recently diagnosed with TB and is currently undergoing treatment.

Physical Examination:

- Vital Signs:

- Respiratory rate: 28 breaths/min

- Heart rate: 110 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 90%

- Temperature: 101°F (38.3°C)

- **Lung Auscultation:** Bilateral wheezing, crackles, and rales
- **Chest Examination:** Dullness to percussion, decreased chest expansion

Diagnostic Tests:

- **Spirometry:**

- FEV1: 40% predicted

- FVC: 60% predicted

- Peak Flow Meter: 180 L/min (30% predicted)

- Methacholine Challenge Test: Positive
- Chest X-ray: Bilateral infiltrates consistent with TB
- Sputum Smear: Positive for Mycobacterium tuberculosis

Assessment and Diagnosis:

Karan's symptoms, physical examination, and diagnostic test results are consistent with asthma complicated by TB.

Treatment Plan:

1. **Anti-TB Medications:**

- Isoniazid 300 mg daily

- Rifampicin 600 mg daily

- Ethambutol 800 mg daily

- Pyrazinamide 1,500 mg daily

2. Inhaled Corticosteroids (ICS): Fluticasone 500 mcg twice daily

3. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

4. Long-Acting Beta-Agonist (LABA): Salmeterol 50 mcg twice daily

5. Leukotriene Modifier: Montelukast 10 mg daily

Hospitalisation:

Karan requires hospitalisation for close monitoring and management of his TB and asthma. He will need:

- Close monitoring of his vital signs and oxygen saturation
- Administration of anti-TB medications and asthma treatments
- Regular chest physiotherapy to help clear secretions
- Nutritional support to help manage weight loss and fatigue

Physiotherapy Management:

Karan will benefit from a physiotherapy program focusing on:

1. Chest Physiotherapy: Regular sessions to help clear secretions and improve lung function

2. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function and overall respiratory health

3. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness and reduce asthma symptoms

4. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body, to improve respiratory function

5. Postural Education: Educate Karan on proper posture to reduce the impact of asthma on lung function

6. Sports-Specific Training: Gradually introduce sports-specific training to help Karan return to his sport

Outcome:

Karan's TB and asthma symptoms improved significantly within 6 months of starting treatment. He was able to reduce his medication use and return to his sport without experiencing symptoms. With ongoing monitoring and adjustments to his treatment plan, Karan is able to manage his asthma and TB effectively and maintain a good quality of life.

Case Study 8 : Asthma Management with Chronic Inhalation Problem

Patient Information

- **Name:** Priya Jain
- **Age:** 28 years
- **Sex:** Female
- **Occupation:** Marketing Manager
- **Residence:** Lives in a metro city with high air pollution
- **Medical History:** Asthma, chronic inhalation problem

Chief Complaint

Priya presents with recurring episodes of shortness of breath, wheezing, and coughing, which worsen in the travelling time. She also complains of chronic cough and sputum production.

History of Present Illness

Priya's asthma symptoms started 5 years ago, and have worsened over time. She has been experiencing chronic inhalation problems due to exposure to air pollution in the metro city.

Physical Examination

- Vital Signs:

- Respiratory rate: 24 breaths/min

- Heart rate: 100 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 92%

- Lung Auscultation: Bilateral wheezing, crackles, and rales
- Chest Examination: Hyperinflation, decreased chest expansion

Diagnostic Tests

- **Spirometry:**

  - FEV1: 50% predicted

  - FVC: 70% predicted

- Peak Flow Meter: 200 L/min (40% predicted)

- Methacholine Challenge Test: Positive

- Chest X-ray: Hyperinflation, peribronchial cuffing

- Air Quality Index (AQI) Monitoring: High levels of particulate matter (PM2.5 and PM10)

Assessment and Diagnosis

Priya's symptoms, physical examination, and diagnostic test results are consistent with asthma complicated by chronic inhalation problem due to exposure to air pollution.

Treatment Plan

Allopathy Medicines

1. Inhaled Corticosteroids (ICS): Ciclesonide 160 mcg twice daily

2. Long-Acting Beta-Agonist (LABA): Vilanterol 25 mcg twice daily

3. Short-Acting Beta-Agonist (SABA): Levalbuterol 76 mcg as needed

4. Mast Cell Stabilizer: Cromolyn sodium 20 mg four times a day

5. Anticholinergic: Tiotropium 18 mcg once daily

Ayurvedic Medicines

1. Tulsi (Ocimum sanctum): 2-3 times a day to help alleviate respiratory symptoms

2. Turmeric (Curcuma longa): 2-3 times a day to help reduce inflammation

3. Ginger (Zingiber officinale): 2-3 times a day to help alleviate coughing and wheezing

4. Kaphaketu: 2-3 times a day to help reduce Kapha dosha

Physiotherapy Management

Priya will benefit from a physiotherapy program focusing on:

1. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function

2. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness

3. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body

4. Postural Education: Educate Priya on proper posture to reduce the impact of asthma on lung function

5. Stress Management: Educate 5. : Educate Priya on stress management techniques like meditation and deep breathing

Machinery Physiotherapy

1. Inspiratory Muscle Trainer (IMT) to strengthen inspiratory muscles

2. High-Flow Nasal Oxygen (HFNO) Therapy to improve oxygenation

3. Electrical Muscle Stimulation (EMS) to enhance muscle strength and endurance

4. Incentive Spirometer to encourage deep breathing exercises

5. Pneumobelt to strengthen diaphragmatic muscles

Outcome

Priya's asthma symptoms improved significantly within 3 months of starting treatment. She was able to reduce her medication use and engage in physical activities without experiencing symptoms. With ongoing monitoring and adjustments to her treatment plan, Priya is able to manage her asthma effectively and maintain a good quality of life.

Case Study 9 : Asthma Management with Mild Symptoms

Patient Information

- **Name:** Tenzin Lhamo
- **Age:** 25 years
- **Sex:** Female
- **Occupation:** Clerk
- **Residence:** Lives in a suburban area with moderate air pollution
- **Medical History:** Asthma (mild symptoms)

Chief Complaint

Tenzin presents with occasional episodes of shortness of breath, wheezing, and coughing, which worsen during exercise or exposure to cold air.

History of Present Illness

Tenzin's asthma symptoms started 2 years ago, and have been mild and intermittent. She has been experiencing symptoms more frequently over the past 6 months.

Physical Examination

- **Vital Signs:**

- Respiratory rate: 20 breaths/min

- Heart rate: 90 beats/min

- Blood pressure: 120/80 mmHg

- Oxygen saturation (SpO2): 95%

- **Lung Auscultation:** Mild wheezing and crackles
- **Chest Examination:** Normal chest expansion

Diagnostic Tests

- **Spirometry:**

- FEV1: 80% predicted

- FVC: 90% predicted

- Peak Flow Meter: 350 L/min (70% predicted)
- Methacholine Challenge Test: Mild response

Assessment and Diagnosis

Tenzin's symptoms, physical examination, and diagnostic test results are consistent with mild asthma.

Treatment Plan

Allopathy Medicines

1. Inhaled Corticosteroids (ICS): Fluticasone 100 mcg twice daily

2. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

Ayurvedic Medicines

1. Tulsi (Ocimum sanctum): 2-3 times a day to help alleviate respiratory symptoms

2. Turmeric (Curcuma longa): 2-3 times a day to help reduce inflammation

3. Ginger (Zingiber officinale): 2-3 times a day to help alleviate coughing and wheezing

Physiotherapy Management

Active Physiotherapy

1. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function

2. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness

3. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body

Passive Physiotherapy

1. Inspiratory Muscle Trainer (IMT): To strengthen inspiratory muscles

2. High-Flow Nasal Oxygen (HFNO) Therapy: To improve oxygenation

3. Electrical Muscle Stimulation (EMS): To enhance muscle strength and endurance

Outcome

Tenzin's asthma symptoms improved significantly within 2 months of starting treatment. She was able to reduce her

medication use and engage in physical activities without experiencing symptoms. With ongoing monitoring and adjustments to her treatment plan, Tenzin is able to manage her asthma effectively and maintain a good quality of life.

Case Study 10: Asthma Management in a Geriatric Patient with COPD, Recent Surgery, and Obesity

Patient Information

- **Name:** Shrinivasan Reddy
- **Age:** 70 years
- **Sex:** Male
- **Occupation:** Retired
- **Residence:** Lives in a hot and humid climate
- **Medical History:** Asthma, COPD, recent surgery (coronary artery bypass grafting), obesity (BMI 35 kg/m2)
- **Weight:** 90 kg
- **Height:** 165 cm

Chief Complaint

Shrinivasan presents with worsening shortness of breath, wheezing, and coughing, which worsen in the morning and evening. He also complains of increased sputum production, fatigue, and difficulty walking due to shortness of breath.

History of Present Illness

Shrinivasan's asthma symptoms started 10 years ago, and have worsened over time. He was diagnosed with COPD 5 years ago. He underwent coronary artery bypass grafting surgery 2 months ago and has been experiencing worsening respiratory symptoms since then.

Physical Examination

- **Vital Signs:**

- Respiratory rate: 28 breaths/min

- Heart rate: 110 beats/min

- Blood pressure: 140/90 mmHg

- Oxygen saturation (SpO2): 88%

- Lung Auscultation: Bilateral wheezing, crackles, and rales
- Chest Examination: Hyperinflation, decreased chest expansion
- Abdominal Examination: Central obesity

Diagnostic Tests

- **Spirometry:**

- FEV1: 40% predicted

- FVC: 60% predicted

- **Peak Flow Meter:** 150 L/min (30% predicted)
- **Chest X-ray:** Hyperinflation, peribronchial cuffing
- **Arterial Blood Gas (ABG) Analysis:** pH 7.32, PaCO2 50 mmHg, PaO2 60 mmHg

Assessment and Diagnosis

Shrinivasan's symptoms, physical examination, and diagnostic test results are consistent with severe asthma and COPD, complicated by recent surgery and obesity.

Treatment Plan

Allopathy Medicines

1. Inhaled Corticosteroids (ICS): Fluticasone 250 mcg twice daily

2. Long-Acting Beta-Agonist (LABA): Salmeterol 50 mcg twice daily

3. Short-Acting Beta-Agonist (SABA): Albuterol 90 mcg as needed

4. Phosphodiesterase-4 (PDE4) Inhibitor: Roflumilast 500 mcg once daily

5. Oxygen Therapy: 2 L/min via nasal cannula

Physiotherapy Management

Active Physiotherapy

1. Breathing Exercises: Diaphragmatic breathing, yoga, and Pilates to improve lung function

2. Aerobic Exercise: Gradually increasing aerobic exercise, such as walking or cycling, to improve cardiovascular fitness

3. Strength Training: Resistance exercises to build muscle strength, particularly in the upper body

4. Weight Loss Program: Diet and exercise program to achieve weight loss and improve obesity-related comorbidities

Passive Physiotherapy

1. Inspiratory Muscle Trainer (IMT): To strengthen inspiratory muscles

2. High-Flow Nasal Oxygen (HFNO) Therapy: To improve oxygenation

3. Electrical Muscle Stimulation (EMS): To enhance muscle strength and endurance

Outcome

Despite aggressive treatment, Shrinivasan's condition deteriorated rapidly. He experienced a severe asthma exacerbation, which led to respiratory failure. Unfortunately, Shrinivasan passed away due to complications from asthma.

Discussion

Shrinivasan's case highlights the importance of prompt and aggressive treatment of asthma exacerbations, particularly in geriatric patients with comorbidities such as COPD, recent surgery, and obesity. Despite the best efforts of the healthcare team, Shrinivasan's condition deteriorated rapidly, leading to a fatal outcome. This case serves as a reminder of the importance of careful monitoring and timely intervention in patients with severe asthma.

Review of literature

Books

Physiotherapy in Respiratory care (Author Alexandra Haugh)

Human Anatomy (Author B.D Chaurasia)

Textbook of Physiotherapy (Author Basant Kumar Nanda)

Websites

https://www.physio-pedia.com/Asthma

https://my.clevelandclinic.org/health/diseases/6424-asthma

https://www.physiomobility.com/asthma-physiotherapy/